Technology Opportunity

Innovative Ventricular Assist System

The Cleveland Clinic Foundation (CCF) plans to develop a permanently implantable blood pumping system to address the shortage of donor hearts for heart attack victims. The device to be developed is referred to as the Innovative Ventricular Assist System (IVAS); it will feature a permanently implantable, nonpulsatile, continuous-flow blood pump. The IVAS could save thousands of lives each year. NASA's objective is to assist the CCF Bioengineering Department in the design and development of a radial bladed pump for the IVAS. NASA has pump codes that have wide applications for axial, mixed flow and radial pumps.

Potential Commercial Uses

- Permanently implantable ventricular heart pump
- Commercial water pump design and analysis
- Cryogenic pump analysis and design

Benefits

- Supplements finite number of organic implants

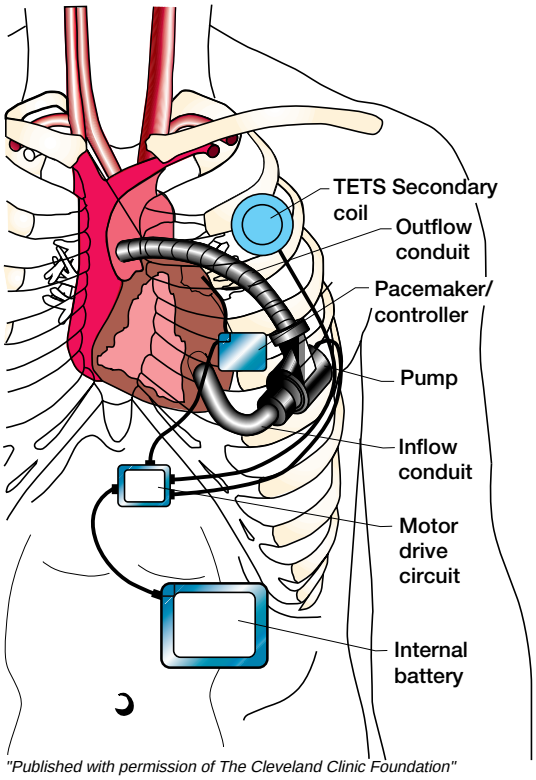

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Figure 1.—In vivo pump placement.

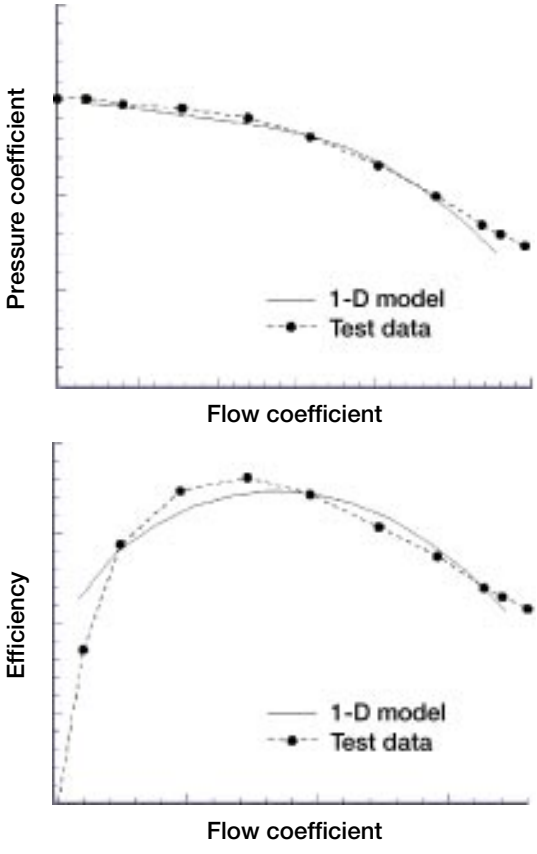

Figure 2.—Blood pump laboratory test data.

National Aeronautics and Space Administration
Lewis Research Center

The Technology

Turbomachinery blade design and analysis codes that were developed at NASA Lewis for the aerospace industry are being used in the IVAS blood pump design project. A one-dimensional computer flow model of the impellers within the pump has been created and validated with laboratory test data. The lumped-parameter empirical flow model characterizes the relationships of pump pressure rise, flow, rotational speed, efficiency, and power consumption. In the first phase of the project, a prototype pump will be developed in the laboratory by using a water-glycerin mixture to simulate the fluid properties of blood. Later phases will include in vivo testing and, eventually, commercialization.

Options for Commercialization

The NASA Lewis pump codes used in this project are available for other commercial applications.

Figure 3—The IVAS Heart Pump.

Contact

Joseph P. Veres
NASA Lewis Research Center
Cleveland OH 44135
Phone: (216) 433-2436
E-mail: jveres@lerc.nasa.gov

Dr. Leonard Golding
Cleveland Clinic Foundation
Phone: (216) 444-1205
E-mail: golding@bme.ri.ccf.org

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